

## CLAIMS

1. A purification process of thermoprocessable tetrafluoroethylene (TFE) copolymers comprising the following steps:
  - A) the polymer latex of thermoprocessable tetrafluoroethylene (TFE) copolymers obtained by the polymerization in dispersion or aqueous emulsion, is transformed into gel form, under mechanical stirring, by addition of an acid electrolyte having pH values ≤ 2, preferably in the range 0.4-1.6;
  - B) washing of the polymer gel with acid aqueous solutions or neutral aqueous solutions having pH from 1 to 7.
2. A purification process according to claim 1, carried out in batch or in a continuous way.
3. A process according to claims 1-2, carried out in batch, wherein step A) for obtaining the polymer latex under the gel form is carried out in a vessel equipped with baffles and stirring devices, preferably pitched blade devices.
4. A batch process according to claims 1-3, wherein step A) comprises the following steps:
  - optionally, dilution with water of the polymerization latex, having a concentration of about 30-40% by weight, to a concentration in the range 5-25% by weight;

keeping under mechanical stirring the latex with a specific power from 1.5 to 5 kW/m<sup>3</sup>, addition of an acid electrolyte, preferably nitric acid, to a pH value ≤ 2, preferably from 0.4 to 1.6.

5. A batch process according to claims 1-4, wherein the washing step B) comprises the following steps:

- 1) mechanical stirring stop and addition of an aqueous solution as indicated in B); the added water amount being comprised between 100 and 200 parts of water for 100 parts of polymer gel;
- 2) subsequent gel mechanical stirring at a peripheral rate of the stirrer comprised between 0.1 and lower than 0.6 m/s with a specific power generally in the range 0.2-2 kW/m<sup>3</sup>, for a time from 1 to 10 minutes;
- 3) stirring stop, gel flock decantation and removal of the supernatant water;

the washing step B) being generally repeated for 3-10 times, preferably for 4-8 times.

6. A process according to claims 1-2, carried out in a continuous way, wherein the polymer latex under the gel form (step A) is obtained by feeding the polymer latex in counter-current to a continuous flow washing column having the following features:

- multistage column equipped in each stage with

baffles and with one or more devices for the mechanical stirring, preferably conic discs, disc turbines, pitched blade, more preferably disc turbines;

- the column height/diameter ratio is higher than 5, preferably between 8 and 20;
- the stage number is comprised between 5 and 20;
- the first stage at the column top and the last stage at the column bottom have no stirring devices,
- the acid electrolyte is fed along the column.

the polymer latex being directly fed to the first stage of the column, the washing water flows in from the bottom and flows out from the upper part of the column.

7. A process according to claim 6, wherein the fed acid electrolyte amount determines at the first stage of the column pH conditions lower than or equal to 2, preferably between 0.4 and 1.6.
8. A process according to claims 6-7, wherein the stirrer peripheral rate is lower than 0.6 m/s, preferably between 0.1 and 0.5 m/s, and the temperature inside the washing column is in the range 10°C-40°C.
9. A process according to claims 6-8, wherein the linear rate of the washing water in the column is lower than 1 cm/sec.

10. A process according to claims 6-9, wherein the ratio between the washing water flow rate and the latex flow-rate, is in the range 1:1-10:1, preferably 1.5:1-5:1.
11. A process according to claims 1-10, wherein the acid electrolyte is an inorganic acid, preferably nitric acid, hydrochloric acid, more preferably nitric acid.
12. A process according to claims 1-11, wherein the thermoprocessable TFE copolymers are obtained by polymerization of TFE with one or more monomers containing at least one unsaturation of ethylene type, preferably fluorinated, selected from the following:
  - $C_3$ - $C_8$  perfluoroolefins, preferably hexafluoropropene (HFP);
  - $C_2$ - $C_8$  hydrogenated fluoroolefins, selected from vinyl fluoride (VF), vinylidene fluoride (VDF), trifluoroethylene, hexafluoroisobutene and perfluoroalkylethylene  $CH_2=CH-R_f$ , wherein  $R_f$  is a  $C_1$ - $C_6$  perfluoroalkyl;
  - $C_2$ - $C_8$  chloro- and/or bromo- and/or iodo-fluoroolefins, preferably chlorotrifluoroethylene (CTFE);
  - (per)fluoroalkylvinylethers (PAVE)  $CF_2=CFOR_f$ , wherein  $R_f$  is a  $C_1$ - $C_6$  (per)fluoroalkyl, preferably  $CF_3$ ,  $C_2F_5$ ,  $C_3F_7$ ;
  - (per)fluoro-oxyalkylvinylethers  $CF_2=CFOX$ , wherein X

is: a  $C_1$ - $C_{12}$  alkyl, a  $C_1$ - $C_{12}$  oxyalkyl, a  $C_1$ - $C_{12}$  (per)-fluoro oxyalkyl having one or more ether groups, preferably perfluoro-2-propoxy-propyl;

- fluorodioxoles, preferably perfluorodioxoles;
- non conjugated dienes of the type:

$CF_2=CFOCF_2CF_2CF=CF_2$ ,

$CFX^1=CX^2OCX^3X^4OCX^2=CX^1F$

wherein  $X^1$  and  $X^2$ , equal to or different from each other, are F, Cl or H;  $X^3$  and  $X^4$ , equal to or different from each other, are F or  $CF_3$ , which during the polymerization cyclopolymerize;

- fluorovinylethers (MOVE) of general formula:

$CFX_{AI}=CX_{AI}OCF_2OR_{AI}$  (A-I) wherein  $R_{AI}$  is a  $C_2$ - $C_6$  linear, branched or  $C_5$ - $C_6$  cyclic (per)fluoroalkyl group, or a  $C_2$ - $C_6$  linear, branched (per)fluoro oxyalkyl group, containing from one to three oxygen atoms; when  $R_{AI}$  is a fluoroalkyl or a fluoroxyalkyl group as above it can contain from 1 to 2 atoms, equal or different, selected from the following: H, Cl, Br, I;  $X_{AI}$  = F, H; the compounds of general formula:

$CFX_{AI}=CX_{AI}OCF_2OCF_2CF_2Y_{AI}$  (A-II) wherein  $Y_{AI}$  = F,  $OCF_3$ ;

$X_{AI}$  as above are preferred; in particular (MOVE I)  $CF_2=CFOCF_2OCF_2CF_3$  (A-III) and (MOVE II)  $CF_2=CFOCF_2OCF_2CF_2OCF_3$  (A-IV) are preferred.

13. A process according to claim 12, wherein hydrogenated olefins are used in addition to the fluorinated comonomers.
14. A process according to claims 12-13, wherein the comonomer amount in the copolymer is in the range 1-18% by weight, preferably 2-10% by weight.
15. A process according to claims 1-14, wherein on the thermoprocessable polymer powder a drying step is carried out at a temperature from 230° to 280°C.
16. Thermoprocessable TFE copolymers according to claims 12-14, containing an amount of extractable cations lower than 1 ppm.
17. Thermoprocessable TFE copolymers according to claim 15, containing an amount of extractable cations lower than 1 ppm and of residual surfactants lower than about 10 ppm.